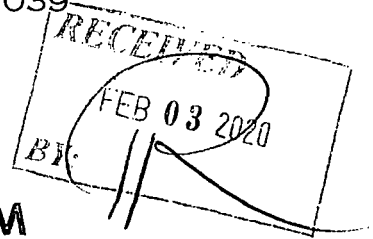


**ARIZONA STATE VETERINARY MEDICAL EXAMINING BOARD**

1740 W. ADAMS ST., SUITE 4600, PHOENIX, ARIZONA 85007

PHONE (602) 364-1PET (1738) FAX (602) 364-1039

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**COMPLAINT INVESTIGATION FORM**

If there is an issue with more than one veterinarian please file a separate Complaint Investigation Form for each veterinarian

PLEASE PRINT OR TYPE

**FOR OFFICE USE ONLY**

Date Received: Feb. 3, 2020

Case Number: 20-67

**A. THIS COMPLAINT IS FILED AGAINST THE FOLLOWING:**

Name of Veterinarian/CVT: Dr. Karin M. Burns

Premise Name: Priority Pet Hospital

Premise Address: 4902 S Val Vista Dr. Suite 108

City: Gilbert State: AZ Zip Code: 85298

Telephone: 480-857-7234

**B. INFORMATION REGARDING THE INDIVIDUAL FILING COMPLAINT\*:**

Name: Warde and Paula Nichols

Address: [REDACTED]

City: [REDACTED] State: [REDACTED] Zip Code: [REDACTED]

Home Telephone: [REDACTED] Cell Telephone: [REDACTED]

\*STATE LAW REQUIRES WE HAVE TO DISCLOSE YOUR NAME UNLESS WE CAN SHOW THAT DISCLOSURE WILL RESULT IN SUBSTANTIAL HARM TO YOU, SOMEONE ELSE OR THE PUBLIC PER A.R.S. § 41-1010. IF YOU HAVE REASON TO BELIEVE THAT SUBSTANTIAL HARM WILL RESULT IN DISCLOSURE OF YOUR NAME PLEASE PROVIDE COPIES OF RESTRAINING ORDERS OR OTHER DOCUMENTATION.

**C. PATIENT INFORMATION (1):**

Name: Naunee

Breed/Species: Pug/Canine

Age: 8 years Sex: F neutered Color: Tan

**PATIENT INFORMATION (2):**

Name: \_\_\_\_\_

Breed/Species: \_\_\_\_\_

Age: \_\_\_\_\_ Sex: \_\_\_\_\_ Color: \_\_\_\_\_

**D. VETERINARIANS WHO HAVE PROVIDED CARE TO THIS PET FOR THIS ISSUE:**

*Please provide the name, address and phone number for each veterinarian.*

Dr. Karin M. Burns, 4802 S'Val Vista Dr., Suite 108, Gilbert, AZ 85298, 480-857-7234

Dr. Katherine F. Smith, 86 West Juniper Ave., Gilbert, AZ 85233, 480-497-0222

**E. WITNESS INFORMATION:**

*Please provide the name, address and phone number of each witness that has direct knowledge regarding this case.*

Eugene R. Borman, DVM, MS was consulted after all treatment was completed to review all records associated with the post dental respiratory distress.

**Attestation of Person Requesting Investigation**

By signing this form, I declare that the information contained herein is true and accurate to the best of my knowledge. Further, I authorize the release of any and all medical records or information necessary to complete the investigation of this case.

Signature: Wade v. Nichols

Date: 1-27-20

**F. ALLEGATIONS and/or CONCERNS:**

*Please provide all information that you feel is relevant to the complaint. This portion must be either typewritten or clearly printed in ink.*

Arizona Veterinary Medical Board

I am writing to register a complaint against Priority Pet Hospital and Dr. Karin M. Burns. On June 5, 2019, I took my dog Naunee to the previously mentioned hospital. The dog had been fasted overnight and had no water that morning. Naunee was examined at the hospital and an anesthetic was given and a dental procedure was performed. Following the dental procedure, and after ending the anesthesia, the dog developed severe respiratory distress.

My complaint is not about the dental procedure but about the immediate follow-up care following the anesthesia. The doctor at Priority Pet Hospital said that Naunee developed severe respiratory problems from aspiration. There was an undocumented window of three hours after removing the endotracheal tube before Naunee was diagnosed with severe respiratory problems. The endotracheal tube was removed almost immediately after ending the dental procedure which had to be before Naunee had recovered very much. That removal of the endotracheal tube was before the ability to swallow reflex could have significantly been present, nor could there have been adequate breathing of a brachiocephalic airway. I think that violates Article 5 R3-11-502 in Standard of Practice #4.

Emergency treatment and care was instituted at Priority Pet Hospital. Naunee was then transferred to Arizona Veterinary Emergency and Critical Care Center. I think the emergency treatment following Naunee's diagnosis of respiratory problems was proper and further treatment at the emergency clinic was excellent. When I picked up Naunee at the Priority Pet Hospital for transport to the emergency clinic, she was partially sedated and gasping for breath. I felt at the time she would die before we arrived at the emergency clinic. I also thought an endotracheal tube would have helped her breathing while in transit.

Naunee made a slow but good recovery. It has been noted that her breathing seems to be more louder now than before the respiratory emergency. Naunee is an eight-year-old pug. Because of the short faced breed I feel that recovery was not adequately cared for which would have prevented the respiratory problem.

For your information, I attempted to sue the animal hospital to recover the expense incurred for treatment and lost that suit. The loss was a technical failure that my expert witness had not read the veterinary regulations for Arizona. No attempt was made by the judge to determine if a failure at the treating hospital had occurred. He said that Dr. Borman's statements were not valid because he had not read the regulations for Arizona.

A brachiocephalic dog requires greater concern, care and planning when giving an anesthetic and in the recovery period. I do not think that these needs were met. The hospital in question, is a member of the American Animal Hospital Association and it is expected that they will meet its standards. Part of my reason for selecting that hospital was because of its membership in the American Animal Hospital Association. When you refer to the American Animal Hospital guidelines for dog anesthesia, you will see that post anesthesia monitoring requirements were not met. I have attached statements from Dr. Eugene R Borman, DVM, MS and the American animal Hospital Association recommended protocol for anesthesia.

Paula and Warde Nichols

This letter is in reference to treatment performed at the veterinary clinic of on June 5, 2019 on the dog, Naunee. I gave expert testimony regarding a review of the documents from Priority Pet Hospital treatment. The Nichols had filed a lawsuit against Priority Pet Hospital and Dr. Karin M. Burns. The judge refused to accept my testimony because I had not specifically read the Arizona Veterinary Medical Examining Board Administrative Rules regarding Arizona veterinary practice. I have now read all Arizona's veterinary regulations and articles relating to and including Standards of Practice. This reading did not change my thinking at all but it does highlight with exactness that you cannot write a regulation in a state that can cover all the varieties of animals and their special needs regarding the use of anesthesia and recovery from anesthesia. By definition you have to write a broad regulation and in my 43 years of practice that definition is subject to the quality of care that is demanded in practice by a comparing to other competent veterinarians in a region.

There are several problems in this case that bother me. The most obvious is that the dog Naunee was found to suddenly be cyanotic with increased respiratory rate after over three hours following the end of anesthesia and the removal of the endotracheal tube. At that stage, there must have been developing problems for a significant length of time and it was not discovered. Perhaps one of those reasons for lack of discovery is that because Naunee has a somewhat typical short face breathing noise and that increased noise and exertion to breathe made the staff disregard Naunee during some of this critical time of recovery. That failure would indicate a lack of understanding of brachiocephalic breeds and their breathing and need for special care in recovery from anesthesia.

My extensive background in working with brachiocephalic dogs and giving anesthetics and being responsible for their recovery, has led me to understand that much more careful monitoring is required for this type of dog. I am also not convinced that Naunee's respiratory problem was aspiration. I will discuss that in a moment. Even if it was aspiration, the endotracheal tube should have been left in place until the swallowing reflex had recovered sufficiently to prevent aspiration or greatly decreased the risk of aspiration. The endotracheal tube was removed almost immediately following the dental procedure. Leaving the endotracheal tube in for a longer period might also have helped avoid brachiocephalic airway interference during recovery. It is now also common for veterinarians dealing with brachiocephalic breeds to use anti-vomiting drugs that are fairly new. These drugs further improve recovery and prevent problems. When a brachiocephalic dog is recovering from anesthesia, they may exert so strongly to breathe from several different causes of restricted airway, that these increased effort to breathe create some negative pressures in the respiratory system and if there was vomiting it would be more likely aspirated. That is one of the reasons to leave that endotracheal tube in place until they are swallowing well in their recovery. Some would say they're worried about the dog chewing on the tube but with proper monitoring that just doesn't happen.

As you know, diagnosing aspiration pneumonia clinically is a very difficult problem. The only definitive way is to have seen the aspiration which in this case did not occur, or to do a tracheal wash exam to

identify stomach contents in the airway. This was not done by the dental clinic or by the emergency clinic. I do not fault them for that but without having done that the definitive diagnosis was not possible.

A syndrome that is not frequently reported can occur when a brachiocephalic dog has had airway restriction and then had great exertional efforts to breathe, they can develop severe hemorrhage in their lungs. Naunee had the whole right chest lung field collapsed. Radiographs taken to evaluate Naunee's problem were also compatible with exertional hemorrhage and edema. The extensive lung involvement and short development time, seems extreme for an aspiration of a dog that had been fasted and kept off water. There also may have been a contributing factor, on the x-rays taken during treatment for Naunee's emergency respiratory problem it was discovered, a large amount of air was in the stomach. It is unknown whether that air was in the stomach before emergency respiratory efforts were implemented. If somehow that air was in the stomach from a misplaced endotracheal tube initially placed in the esophagus at the start of the dental procedure, then that might have contributed to aspiration. The presence of that large amount of air is abnormal and should not have been present. No record indicated that there was vomit in the cage or in Naunee's mouth or pharynx.

The exact cause of Naunee's collapsed lungs was never identified. Prevention of that lung collapse was totally the responsibility of the attending Veterinarian and hospital staff. I do not believe that the Arizona veterinary standard of practice rules and regulations define exactly what constitutes proper or improper anesthesia recovery monitoring. There were several events during Naunee's recovery which indicate a problem and include, no documented monitoring more than just at the time of removing the endotracheal tube, the tube was removed too early and the large amount of air in the stomach indicating an incorrect procedure. In my research regarding aspiration, it is listed as occurring infrequently, but in at least one study involving 8 universities, during the performance of a dental procedure, no association was found with aspiration during anesthesia or in recovery.

I think a review is warranted.

Sincerely,



Eugene R. Borman, DVM, MS

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# AAHA Anesthesia Guidelines for Dogs and Cats\*

Richard Bednarski, MS, DVM, DACVA (Chair), Kurt Grimm, DVM, MS, PhD, DACVA, DACVCP,  
Ralph Harvey, DVM, MS, DACVA, Victoria M. Lukasik, DVM, DACVA, W. Sean Penn, DVM, DABVP (Canine/Feline),  
Brett Sargent, DVM, DABVP (Canine/Feline), Kim Spelts, CVT, VTS, CCRP (Anesthesia)

## ABSTRACT

Safe and effective anesthesia of dogs and cats rely on preanesthetic patient assessment and preparation. Patients should be premedicated with drugs that provide sedation and analgesia prior to anesthetic induction with drugs that allow endotracheal intubation. Maintenance is typically with a volatile anesthetic such as isoflurane or sevoflurane delivered via an endotracheal tube. In addition, local anesthetic nerve blocks; epidural administration of opioids; and constant rate infusions of lidocaine, ketamine, and opioids are useful to enhance analgesia. Cardiovascular, respiratory, and central nervous system functions are continuously monitored so that anesthetic depth can be modified as needed. Emergency drugs and equipment, as well as an action plan for their use, should be available throughout the perianesthetic period. Additionally, intravenous access and crystalloid or colloids are administered to maintain circulating blood volume. Someone trained in the detection of recovery abnormalities should monitor patients throughout recovery. Postoperatively attention is given to body temperature, level of sedation, and appropriate analgesia. (*J Am Anim Hosp Assoc* 2011; 47:377–385. DOI 10.5326/JAAHA-MS-5846)

*There are no safe anesthetic agents, there are no safe anesthetic procedures.  
There are only safe anesthetists.—Robert Smith, MD<sup>a</sup>*

## Introduction

The purpose of this article is to provide guidelines for anesthetizing dogs and cats, which can be used daily in veterinary practice. This will add to the existing family of American Animal Hospital Association (AAHA) guidelines<sup>b</sup> and other references, such as the anesthesia monitoring guidelines published by the American College of Veterinary Anesthesiologists (ACVA)<sup>c</sup>.

This article includes recommendations for preanesthetic patient evaluation and examination, selection of premedication, induction and maintenance drugs, monitoring, equipment, and recovery. In recognition of differences among practices, these guidelines are not meant to establish a universal anesthetic plan or legal standard of care.

## Preanesthetic Evaluation

The preanesthetic patient evaluation identifies individual risk factors and underlying physiologic challenges that contribute information for development of the anesthetic plan. Factors to be evaluated include the following:

- History: Identify risk factors, including responses to previous anesthetic events, known medical conditions, and previous adverse drug responses. Identify all prescribed and over-the-counter medications (including aspirin) and supplements to avoid adverse drug interactions.<sup>1</sup>
- Physical examination: A thorough physical examination may reveal risk factors, such as heart murmur and/or arrhythmia or abnormal lung sounds.

From the Veterinary Medical Center, The Ohio State University, Columbus, OH (R.B.); Veterinary Specialist Services PC, Conifer, CO (K.G.); Department of Small Animal Clinical Sciences, University of Tennessee College of Veterinary Medicine, Knoxville, TN (R.H.); Southwest Veterinary Anesthesiology, Southern Arizona Veterinary Specialists, Tucson, AZ (V.L.); Phoenix, AZ (W.S.P.); Front Range Veterinary Clinic, Lakewood, CO (B.S.); and Peak Performance Veterinary Group, Colorado Springs, CO (K.S.)

Correspondence: richard.bednarski@cvm.osu.edu (R.B.)

AAHA American Animal Hospital Association; ACVA American College of Veterinary Anesthesiologists; ASA American Society of Anesthesiologists; AVMA American Veterinary Medical Association; ET endotracheal; PLIT Professional Liability Insurance Trust

\*This report was prepared by a task force of experts convened by the American Animal Hospital Association for the express purpose of producing this article. This report was sponsored by an educational grant from Abbott Animal Health, and was subjected to the same external review process as are all of *Journal of American Animal Hospital Association* articles.

- **Age:** Advanced age can increase anesthetic risk because of changes in cardiovascular and respiratory function. Disease processes occur more commonly in aged patients. Very young patients can be at increased risk from hypoglycemia, hypothermia, and decreased drug metabolism.
- **Breed:** Few breed-specific anesthesia issues are documented. Brachycephalic dogs and cats are more prone to upper airway obstruction. Greyhounds have longer sleep times after receiving some anesthetics such as propofol or thiopental<sup>d</sup>. Some breeds of dogs (e.g., Cavalier King Charles spaniel) and cats (e.g., Maine coon) may be predisposed to cardiac disease as they age.<sup>2</sup>
- **Temperament:** An aggressive or fractious temperament may pose a danger to staff and can limit the preanesthetic evaluation or make examination impossible. The selection of an alternative preanesthetic drug or drug combination may be required for the aggressive or overly fearful animal due to the need for higher-than-usual drug doses. Conversely, a quiet or depressed animal may benefit from lower doses for sedation or anesthesia.
- **Type of procedure:** Evaluate the procedure's level of invasiveness, anticipated pain, risk of hemorrhage, and/or predisposition to hypothermia. Some procedures may limit physical access to the patient for monitoring.
- **Using heavy sedation versus general anesthesia:** This choice depends on the procedure, patient temperament, and the need for monitoring and support. In general, sedation may be appropriate for shorter (<30 min) and less-invasive procedures (e.g., diagnostic procedures, joint injections, suture removal, and wound management). Sedated patients, just as those under general anesthesia, require appropriate monitoring and supportive care. They may require airway management and/or O<sub>2</sub> supplementation. Be prepared to intubate if necessary.
- **Experience and qualifications of personnel:** Previous training in local and regional anesthesia techniques will facilitate their perioperative use. Also, a more experienced surgeon may be faster and cause less tissue trauma to a patient than a less experienced one.

Risk factors and individual patients' needs provide a framework for developing individualized patient plans and may indicate the need for additional diagnostic testing or stabilization before anesthesia.

Individual practice procedures may include a minimum database of laboratory analysis, electrocardiogram, and diagnostic imaging for different patient groups. There is no evidence to indicate the minimum time frame before anesthesia within which laboratory analysis should be performed. However, the timing should be reasonable to detect changes that impact anesthetic risk. The type and timing of such testing is determined by the veterinarian

based on the previously mentioned factors, as well as any change in patient status or the presence of concurrent disease.

Categorization of patients using the American Society of Anesthesiologists (ASA) Patient Status Scale provides a framework for evaluation (Table 1). Patients with a higher ASA status are at greater risk for anesthetic complications and require additional precautions to better ensure a positive outcome.<sup>3</sup>

Client communication is important at all times, but especially before anesthetic procedures. Obtain written informed consent<sup>c</sup> after discussing the patient assessment and risks, the proposed anesthetic plan, and any available medical or surgical alternatives with the client. Include such information in informed consent documents as guided by local and state regulatory agencies.<sup>4</sup>

## Individual Plan Patient Preparation

Before the day of surgery, communicate with the client about how to prepare the pet for anesthesia, such as any recommended changes in administration of medications. Allow free access to water (which may be allowed until the time of premedication).

Recommend fasting before anesthesia to reduce the risk of regurgitation and aspiration, understanding that gastric emptying times vary widely among individual patients and with the contents of the food ingested.<sup>5</sup> Young animals require shorter fasting times. Food should not be withheld for >4 hr before surgery for those from 6 wk to 16 wk of age due to the risk of perioperative hypoglycemia. Although there is evidence to suggest that shorter fasting times (<6 hr) might be sufficient to decrease the risk of regurgitation for those >16 wk of age, overnight fasting is recommended for procedures scheduled earlier in the day.<sup>6</sup>

With emergency procedures, fasting is often not possible, thus attention to airway management is critical. Do not delay emergency procedures when the benefit of the procedure outweighs the benefit of fasting.

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**TABLE 1**

### ASA Physical Status Classification System

- 
1. Normal healthy patient
  2. Patient with mild systemic disease
  3. Patient with severe systemic disease
  4. Patient with severe systemic disease that is a constant threat to life
  5. Moribund patient who is not expected to survive without the operation
- 

Based on the Physical Status Classification System of the American Society of Anesthesiologists, 520 N Northwest Highway, Park Ridge IL 60068-2573; [www.asahq.org](http://www.asahq.org). ASA, American Society of Anesthesiologists.

Diabetic patients may or may not be fasted depending on the veterinarian's preference and anticipation of procedure time. Adjust insulin administration accordingly with food intake. Regardless of how the patient has been fasted, manage the airway of every patient as if its stomach were full.

### Anesthetic Plan

Create an individualized plan for patient management based on the anesthetic risks identified in the preanesthetic evaluation, understanding that no single plan is appropriate for all patients. Resources such as staffing, equipment, and drug availability also influence plan development. A complete anesthetic plan addresses perioperative analgesia, pre- and post-anesthetic sedation and/or tranquilization, induction and maintenance drugs, ongoing physiologic support, monitoring parameters, and responses to adverse events. The plan should be flexible to allow for dynamic patient responses during anesthesia.

### Preanesthetic Medication

The advantages of preoperative sedation and analgesia include lowered patient and staff stress, ease of handling, and reduction of induction and inhalant anesthetic doses, most of which have dose-dependent adverse effects.

There can be disadvantages to the administration of preanesthetic medications, such as dysphoria related to benzodiazepines, bradycardia related to  $\alpha$ -2 agonists and opioids, and hypotension related to acepromazine. These disadvantages can be mitigated by appropriate dosing and selecting the right combination of drugs for the individual. Patients in critical condition may not require any premedication.

### Pain Management

Choose drugs and techniques that provide both intraoperative and postoperative analgesia. Because there is a high variability in patient response to sedation and analgesia, individually tailor the medication type, dose, and frequency based on the anticipated intensity and duration of pain. In addition to opioid premedication, perioperative analgesic techniques include nonsteroidal anti-inflammatory drugs, local and regional nerve blocks, as well as IV infusions of opioids, *N*-methyl-D-aspartate receptor antagonists (e.g., ketamine), and/or lidocaine. Multiple analgesic techniques should be considered for more painful procedures. Frequently reassess patient comfort and adjust pain management as needed. The AAHA Pain Management Guidelines and many other sources provide descriptions of and suggestions for pain management.<sup>7-9</sup>

### Anesthetic Management of Patients with Comorbidities

Certain conditions require modification of the anesthetic protocol. Extensive discussion of the anesthetic management of the diseased patient is beyond the scope of these guidelines. However, brief mention of diabetes, renal, cardiac, and hepatic disease is warranted.

### Diabetes

Perform periodic blood glucose measurements at sufficient intervals throughout the perianesthetic period to detect hypoglycemia or hyperglycemia before it becomes severe. Ideally, diabetic patients should be well regulated before anesthesia induction unless the procedure cannot be delayed.

### Renal Disease

No one anesthetic drug or drug combination is better for renal disease; most important is to maintain blood pressure and adequate renal perfusion. Diuresis of moderately or severely azotemic patients before anesthetic induction may be warranted. Base the specific fluid types and rates on patient condition and response, but generally 1.5–2 times maintenance crystalloid administration for the 12–24 hr before anesthesia will reduce the magnitude of the azotemia. Continue fluids into the postoperative period as patient needs dictate. Fluid rates up to 20–30 mL/kg/hr during anesthesia have been recommended in patients with renal dysfunction.<sup>10,11</sup>

Patients with renal insufficiency may benefit from mannitol-induced diuresis and the associated increased renal medullary perfusion.<sup>12,13</sup> To be effective, low-dose mannitol must be given before the ischemic episode; at higher doses it can cause renal vasoconstriction.

Vasopressors and inotropes have been recommended, but strictly to maintain cardiac output. It has not been concluded that they contribute to increased renal perfusion or renal protection.

### Cardiac Disease

In patients with severe cardiac disease, carefully titrate IV fluids to avoid inducing congestive heart failure from fluid overload. Patients will vary in how much fluid and at what rate they can tolerate. Guide fluid administration by monitoring any of the following: systemic blood pressure, central venous pressure, oxygenation, or auscultation of lung sounds.

Preoperatively evaluate cardiac arrhythmias for consideration of perianesthetic treatment. Cardiac medications should be administered normally the day of surgery. Some medications may potentiate hypotension (e.g., angiotensin-converting enzyme inhibitors and  $\beta$  blockers). Be prepared to administer inotropes or other supportive measures if needed.<sup>14</sup>

*Pain Drugs cause Vomiting frequently*

Opioid analgesics are useful during anesthesia of the patient with cardiovascular compromise. Certain anesthetic medications may be less appropriate in some types of cardiac disease (e.g., at higher doses, ketamine may increase heart rate, which could be a problem in patients with hypertrophic cardiomyopathy; avoid  $\alpha$ -2 agonists in dogs with mitral valve disease).<sup>15</sup> A multimodal approach using drugs from multiple pharmacologic categories is preferred to minimize extreme cardiovascular effects of any one drug.<sup>16</sup>

## Liver Disease

True liver dysfunction also warrants special attention; however, increases in the liver enzymes of an otherwise healthy patient are not an absolute reason to avoid anesthesia. In patients with liver dysfunction, hypoglycemia can be a concern due to insufficient glycogen storage and impaired gluconeogenesis. Dextrose supplementation may be necessary. If hypoproteinemia is present, the administration of fresh frozen plasma may be warranted. In general, delayed anesthetic recovery can be expected with the use of any anesthetic agent metabolized by the liver. Therefore, inhalants and drugs with specific antagonists such as opioids and  $\alpha$ -2 agonists can be useful.

## Areas of Controversy

The authors recognize that opinions vary regarding the administration of certain perianesthetic drugs. Some of these are briefly outlined here.

There are misconceptions about the effects of acepromazine in patients with seizure history. There is no evidence to show that acepromazine increases the risk of seizures in epileptic patients or patients with other seizure disorders.<sup>17,18</sup>

Indiscriminant use of anticholinergic drugs such as atropine and glycopyrrolate as part of a premedication protocol is controversial. Some think they should not be used routinely because the action will be short, and they may cause tachycardia, which increases myocardial O<sub>2</sub> consumption and the potential for myocardial hypoxemia.

In contrast, the pre-emptive use of anticholinergics may be indicated for procedures with an increased risk of vagal bradycardia (e.g., ocular surgery) as well as in conjunction with opioid administration, to offset the potential bradycardic effects of the opioid. Anticholinergics may also be indicated in dogs with brachycephalic syndrome, which is associated with airway obstruction and higher resting vagal tone, making these dogs more prone to developing bradycardia than are other breeds.<sup>19</sup>

The simultaneous use of anticholinergics with  $\alpha$ -2 agonists has been debated. Some practitioners prefer to administer

anticholinergics to reduce the magnitude of bradycardia and associated drop in cardiac output. However, the combination creates the potential for myocardial hypoxemia to develop as a result of increased myocardial work. Use of anticholinergics should be based on individual patient risk factors and monitored parameters such as heart rate and blood pressure.<sup>20,21</sup>

## Anesthesia Preparation

Ensure that all equipment and medications deemed necessary for the procedure to be performed are readily accessible and in working order before induction of anesthesia. Regularly ensure proper maintenance and function of all anesthetic equipment. **Table 2** provides a convenient maintenance checklist. Have emergency supplies and protocols available before any anesthetic procedure (e.g., tracheal suction; emergency lighting in the event of power failure). Conspicuously post a chart of emergency drug doses or preemptively calculate such doses for each patient. Familiarize yourself with the most current recommendations for cardiopulmonary cerebral resuscitation and stock appropriate drugs. Useful emergency drug dose charts are available in many texts and also from the Veterinary Emergency and Critical Care Society<sup>6</sup>.

Prepare a written anesthetic record for each patient, beginning with preparation for the anesthetic event and continuing through the recovery period. Record preanesthetic patient status and all perianesthetic events, including drugs and dosages administered, routes of administration, patient vital signs, events, and interventions. Record resuscitation orders in the anesthetic record at the time consent is obtained. Regularly record patient parameters at 5–10 min intervals, or more frequently if sudden changes in physiologic status occur. An anesthetic record template is available from AAHA<sup>1</sup>.

## Patient Preparation

Preparing a patient for anesthesia may include some or all of the following:

- Inserting an IV catheter and administering IV fluids. This helps to avoid perivascular administration of induction drugs. It facilitates intravascular volume support, which may correct hypovolemia resulting from vasodilation and blood loss that can occur during surgery. It also allows for rapid administration of emergency medications.
- Connecting monitoring equipment appropriate for the disease condition present and that the patient will tolerate before induction (**Table 3**).
- Stabilizing hemodynamically unstable patients, including but not limited to:
  - Administering IV fluid boluses. Hypovolemic patients may require isotonic crystalloids, colloids, and/or hypertonic

**TABLE 2****Anesthetic Equipment Check List**

CO <sub>2</sub> absorbent	Change the CO <sub>2</sub> absorbent regularly based on individual anesthesia machine manufacturer recommendations. The useful lifespan of absorbent varies with the patient size and fresh gas flow rate. Color change is not always an accurate indicator of remaining absorption capacity.
Oxygen	Ensure supply lines are attached. Ensure the flowmeter is functioning. Ensure the supply tank and at least one spare tank is sufficiently full. To calculate the estimated remaining tank volume, follow this example: An E-cylinder contains 660 L, and has a full-pressure of 2,200 psi. Pressure drop is proportional to remaining O <sub>2</sub> volume. A tank with 500 psi has 150 L. When used at a flow rate 1 L/min, it will last approximately 2 ½ hr. <sup>22</sup>
Endotracheal tubes and masks	Have access to various sizes of masks and endotracheal tubes. Provide a light source such as a laryngoscope. Check cuff integrity and amount of air needed to properly inflate the cuff.
Breathing system	Refer to anesthesia machine's documentation for proper leak-checking procedures. Conduct a check before every procedure. Select the appropriate size and type of reservoir bag and breathing circuit. <sup>23</sup> Non-rebreathing systems are generally used in patients weighing less than 5–7 kg or when the work of breathing associated with the circle system might not be easily sustainable by an individual patient. <sup>24</sup>
Inhalant	Ensure vaporizer is sufficiently full.
Waste scavenging equipment	Verify a functioning scavenging system. If using a charcoal absorbent canister, ensure there is sufficient capacity remaining for the duration of the procedure. Observe all regulations concerning the dispersion of waste anesthesia gases. <sup>25,26</sup>
Electronic monitoring equipment	Ensure devices are operational and either connected to a power source or have adequate battery reserve. Check alarms for limits and activation.

saline to improve vascular filling, cardiac output, and tissue perfusion.

- Managing cardiac arrhythmias.
- Providing blood products. Hypoproteinemia, anemia, or coagulation disorders can aggravate the decreased delivery of O<sub>2</sub> to the tissues that normally occurs as a result of hypoventilation and recumbency.

- Preoxygenation reduces the risk of hemoglobin desaturation and hypoxemia during the induction process. Preoxygenation is especially beneficial if a prolonged or difficult intubation is expected or if the patient is already dependent on supplemental oxygenation. However, preoxygenation may be contraindicated if it agitates the patient. Removing the rubber diaphragm from the facemask may increase patient tolerance of the mask.<sup>29</sup>

**TABLE 3****Anesthesia Monitoring Tools**

Electrocardiogram
Pulse oximeter (SpO <sub>2</sub> )
Arterial blood pressure monitor
Direct intraarterial BP: Most accurate, but technically difficult to perform
Noninvasive BP (Doppler or oscillometric monitor): Technically easy, but can be inaccurate. <sup>27,28</sup> Evaluate trends in conjunction with other patient parameters. Select cuff width of 40–50% of circumference of limb.
Thermometer: Esophageal probe or periodic rectal temperature with conventional thermometer
Anesthetic gas analyzer (measures inspired and expired inhalant concentration)
Capnometer/capnograph (measures and/or displays CO <sub>2</sub> in expired and inspired gas, and respiratory rate)
Physical observations
Visualization (e.g., eye position, mucous membranes, chest excursion, blood loss, bag volume, and movement with ventilation, equipment function)
Palpation (e.g., pulse quality, jaw tone, palpebral reflex)
Auscultation (heart, lungs): Precordial or esophageal stethoscope

BP, blood pressure; SpO<sub>2</sub>, saturation level of O<sub>2</sub>.

Once the patient is as stable as possible, proceed according to the individual patient plan.

## Anesthetic Induction

Anesthetic induction is best achieved using rapid-acting IV drugs, although this may not always be a reasonable option for fractious patients.<sup>30</sup> IV induction allows for rapid airway control and allows for titration of the induction drug to effect within the given dosage range. Sick, debilitated, or depressed patients will require less drug than healthy, alert patients. A patient's response to pre-anesthetic drugs can influence the amount and type of induction drug needed.

Mask or chamber inductions can cause stress, delayed airway control, and environmental contamination.<sup>31</sup> Adequate room ventilation must be present to minimize exposure to personnel. Reserve these techniques for situations where other alternatives are not suitable.

Ensure endotracheal (ET) tubes and intubation aids (e.g., stylets, laryngoscope) are readily available. Establish and maintain a patent airway using an ET tube as soon as possible. Use the largest diameter ET tube that will easily fit through the arytenoid cartilages without damaging them; this will minimize resistance and the work of breathing. Insert the ET tube such that the distal tip of the tube lies midway between the larynx and the thoracic inlet. Applying a light coating of sterile lubricating jelly improves the cuff's ability to seal the airway against fluid migration.<sup>32</sup>

Inflate the cuff sufficiently to create a seal for adequate positive pressure ventilation, being aware that overinflation may cause tracheal damage.<sup>33</sup> When changing the patient's position after intubation, take care to not rotate the ET tube within the trachea. This might induce tracheal tears, especially if the cuff is relatively overinflated. The American Veterinary Medical Association (AVMA) Professional Liability Insurance Trust (PLIT) has indicated that tracheal tears are a significant issue in anesthetized intubated cats.<sup>34</sup> However, tracheal intubation when properly performed and maintained is an essential part of maintaining an open and protected airway.

Apply corneal lubricant postinduction to protect the eyes from corneal ulceration.

## Maintenance and Monitoring

Anesthesia is typically maintained using inhalant anesthetics, although maintenance can also be achieved with continuous infusions or intermittent doses of injectable agents, or a combination of injectable and inhalant drugs. An O<sub>2</sub>-enriched gas mixture is necessary for the safe and effective administration of inhalant anesthesia.<sup>23,29</sup>

O<sub>2</sub> flow rates depend on the breathing circuit used. For a circle rebreathing system, use a relatively high flow rate when rapid changes in anesthetic depth are needed, such as during the transition from injectables to inhalants (induction) or when turning the vaporizer off at the end of the procedure. During the maintenance phase, total O<sub>2</sub> flow rate should typically be between 200 and 500 mL. The system must be leak free for these flow rates to be effective. These are, perhaps, lower O<sub>2</sub> flow rates than many are accustomed to. The benefits of lower flow rates include decreased environmental contamination and the economy of decreased consumption of O<sub>2</sub> and volatile anesthetic gases. Lower flow rates also conserve moisture and heat. Disadvantages to lower flow rates include increased times to change anesthetic depth. Administer an O<sub>2</sub> flow of approximately 200 mL/kg/min to patients connected to a non-rebreathing circuit.<sup>22</sup>

Guidelines for anesthesia monitoring are available from The American College of Veterinary Anesthesiologists (ACVA).<sup>35</sup> Continue the cardiovascular monitoring and physiologic support measures that began in the patient preparation and/or induction periods. Monitoring includes evaluation of oxygenation, ventilation, cardiac rate and rhythm, adequacy of anesthetic depth, muscle relaxation, body temperature, and analgesia. Blood pressure, heart rate and rhythm, mucous membrane color, and pulse oximetry provide the best indexes of cardiovascular function.

Multiparameter electronic monitors are available and serve as tools to assess physiologic parameters during the perianesthetic period (Table 3). One must always evaluate the data the monitor is conveying in light of all other parameters and make treatment decisions based on the whole picture. Vigilant monitoring, interpretation, and responding to patient physiologic status by well-trained and attentive staff are critical.

Provide thermal support and monitor body temperature throughout the perianesthetic period. Supplemental heat may include warm IV fluids, use of a fluid line warmer, insulation on the patient's feet (e.g., bubble wrap), circulating warm-water blankets, and/or warm air circulation systems. Do not use supplemental heat sources that are not designed specifically for anesthetized patients as they can cause severe thermal injury.<sup>36</sup>

## Troubleshooting—Anesthetic Complications

Recognize and then quickly and effectively respond to complications as they develop. Anesthesia-related complications are responsible for a significant number of AVMA PLIT insurance claims.<sup>3</sup>

Hypoventilation is an expected effect of general anesthesia and can be estimated by observing respiratory rate and depth, but can be quantified using capnometry. Observation of respiratory tidal volume is subjective, and it can be difficult to distinguish

a normal from abnormal tidal volume. Normal end-tidal CO<sub>2</sub> is approximately 35–40 mm Hg in awake patients and approximately 40–50 mm Hg in patients in a light surgical plane of anesthesia. With increasing CO<sub>2</sub>, identify causes such as excessive anesthetic depth, provide initial patient support by positive pressure ventilation, and adjust anesthetic management as indicated.

Hypotension is a common complication during anesthesia. Diagnose hypotension through blood pressure monitoring and evaluation of other physiologic parameters. Therapies for hypotension include decreasing the depth of anesthesia, administering crystalloid and/or colloid boluses, and/or administering vasopressors and inotropes.

Monitor for arrhythmias via auscultation, electrocardiography, or by observing pulse–heart rate incongruity when using Doppler ultrasound. Common perioperative arrhythmias include bradycardia and ventricular arrhythmias. The decision of whether to treat a given arrhythmia should be based on the severity, the effect on other hemodynamic parameters (e.g., blood pressure), and the likelihood of deterioration to a more significant arrhythmia.

There are limited data to provide insight into the causes of anesthetic and perianesthetic deaths in dogs and cats.<sup>37</sup> Many complications and deaths occur during recovery. Most anesthetic deaths are unexplained because of insufficient information regarding the event. Increased monitoring and early diagnosis of physiologic changes and earlier intervention may reduce the risk of anesthetic death.

After an anesthetic death, offer clients the option of having a necropsy performed. Necropsy may detect pre-existing disease that contributed to anesthetic death, which was not detectable with preoperative evaluation. Empathetic communication may help clients deal with loss, anger, and the grief process.

## Recovery

Recovery is a critical phase of anesthesia that includes a continuation of patient support, monitoring, and record keeping. It begins when the anesthetic gas is turned off. It does not end at the time of extubation.

Patients recovering from anesthesia require monitoring by someone trained in the recognition of complications. Although many complications occur throughout anesthesia, most anesthetic-associated deaths occur during recovery, especially in the first 3 hr. Forty-seven percent of canine anesthesia mortalities and 60% of feline anesthesia mortalities have been reported to occur in the postoperative period.<sup>38</sup>

Continue regular monitoring of parameters until they return to near baseline. Pulse oximetry, blood pressure monitoring, and

periodic auscultation are valuable in detecting life-threatening complications. Continue to monitor the electrocardiogram and blood pressure in those patients at significant risk of life-threatening hypotension or dysrhythmias.

Respiratory depression persists during the early recovery from anesthesia. Continue supplemental oxygen until SpO<sub>2</sub> measurements are acceptable when breathing room air.

Extubate when the patient can adequately protect its airway by vigorously swallowing. Deflate the cuff immediately before removing the ET tube. With patients that have undergone a dental procedure or oral surgery, it is beneficial to position the nose slightly lower than the back of the head and leave the ET tube cuff slightly inflated during extubation. This will help clear blood clots and debris from the trachea and deposits any fluid or debris into the pharyngeal region, where it can drain from the mouth or be swallowed, thereby reducing the risk of aspiration.

Recovery from anesthesia can be prolonged in hypothermic patients, resulting in increased morbidity.<sup>39</sup> Provide adequate thermal support until the patient's temperature is consistently rising and approaching normal.

Re-apply eye ointment during the recovery period, especially if an anticholinergic was administered, until an adequate blink reflex is present. Express the bladder if distended to minimize any distention-related discomfort.

Re-assess the patient's pain level and, if necessary, adjust the plan for postoperative pain management. Adequate analgesia and a quiet environment encourage smooth recoveries. Evaluate patients for dysphoria, emergence delirium, and pain. Treat if necessary.<sup>7</sup>

Discharge of patients having undergone anesthesia should only occur after the patient is awake, aware, warm, and comfortable. Evaluate the animal for its responses and its ability to interact safely with owners and maintain physiologic homeostasis. Provide written instructions for owners, outlining the dose and potential side effects of analgesics and other medications to be given to the patient at home.

## Summary/Conclusions

Anesthesia includes more than the selection of anesthetic drugs. A comprehensive individualized anesthetic plan will minimize perioperative morbidity and optimize perioperative conditions. Monitoring, the ability to discern normal from abnormal, and expedient intervention are critical to ensure that potentially reversible problems do not become irreversible. Vigilance and patient support must be maintained during the recovery period.

Successful anesthetic management requires trained, observant team members who understand the clinical pharmacology and physiologic adaptations of the patient undergoing anesthetic



**TABLE 4**
**Websites for More Information**

Group	Web URL	Resources available
American Animal Hospital Association (AAHA)	<a href="http://www.aahanet.org">www.aahanet.org</a> > Resources > Guidelines	AAHA-AAFP Pain Management Guidelines for Dogs & Cats AAHA Senior Care Wellness Guidelines
American College of Veterinary Anesthesiologists (ACVA)	<a href="http://www.acva.org">www.acva.org</a>	Small Animal Monitoring Guidelines; Position statements
American Society of Anesthesiologists (ASA)	<a href="http://www.asahq.org">www.asahq.org</a>	Patient status scale
Colorado State University	<a href="http://www.cvmbs.colostate.edu/clinsci/wing/emdrughp.htm">www.cvmbs.colostate.edu/clinsci/wing/emdrughp.htm</a>	A custom emergency drug list with dosages may be printed for each patient
International Veterinary Academy of Pain Management	<a href="http://www.ivapm.org">www.ivapm.org</a>	Pain management information
Veterinary Anesthesia & Analgesia Support Group (VASG)	<a href="http://www.vasg.org">www.vasg.org</a>	Anesthesia information

AAFP, American Association of Feline Practitioners.

procedures, as well as the use of anesthetic and monitoring equipment. Staff must be able to assess abnormal patient responses quickly and respond efficiently, by being familiar with the expected responses seen with different anesthetic drugs and with the changes seen in the phases and/or depth of general anesthesia. Provide training and review procedures with staff upon hiring, at regular intervals, and after adverse events occur, as part of routine morbidity and mortality discussions.

Anesthesia and anesthetic drugs continually evolve with advances in pharmacology and technology. Numerous anesthesia continuing education opportunities exist, and periodically refreshing your anesthesia knowledge is mandatory. Referral to a board-certified veterinary anesthesiologist should be considered for complex cases that are outside of a practitioner's comfort zone (Table 4).

**FOOTNOTES**

- <sup>a</sup> This quote appears as an introduction to Chapter 1 of: Muir W, Hubbell J, Bednarski R. Introduction to anesthesia. In: Muir WW, Hubbell JAE, Bednarski RM, Skarda RT, eds. *Handbook of veterinary anesthesia*. 4th ed. St. Louis: Elsevier, 2007;1. However, the original source of the quote is not referenced.
- <sup>b</sup> See [www.aahanet.org](http://www.aahanet.org) resources
- <sup>c</sup> See [www.acva.org](http://www.acva.org)
- <sup>d</sup> At the time of this publication, thiopental is not available in the United States
- <sup>e</sup> A standard consent form may be found at [www.avma.org/issues/policy/consent\\_form.asp](http://www.avma.org/issues/policy/consent_form.asp)
- <sup>f</sup> Veterinary Anesthesia & Analgesia Support Group, [www.vasg.org](http://www.vasg.org); International Veterinary Academy of Pain Management, [www.ivapm.org](http://www.ivapm.org)
- <sup>g</sup> See [www.veccs.org](http://www.veccs.org)
- <sup>h</sup> See [www.aahanet.org](http://www.aahanet.org) > AAHA store > Books and products > Anesthesia record
- <sup>i</sup> Personal communication, March 2011, AVMA PLIT
- <sup>j</sup> Personal communication, March 2011, AVMA PLIT

**REFERENCES**

1. Seahorn J, Robertson S. Concurrent medications and their impact on anesthetic management. *Vet Forum* 2002;119:50–67.
2. Gough A, Thomas A. *Breed predispositions to disease in dogs and cats*. Oxford: Blackwell Publishing Ltd., 2004;44, 170.
3. Muir WW. Considerations for general anesthesia. In: Tranquilli WJ, Thurmon JC, Grimm KG, eds. *Lumb and Jones' veterinary anesthesia and analgesia*. 4th ed. Ames: Blackwell; 2007:17–30.
4. Flemming DD, Scott JF. The informed consent doctrine: what veterinarians should tell their clients. *J Am Vet Med Assoc* 2004;224(9):1436–9.
5. Bednarski RM. Dogs and cats. In: Tranquilli WJ, Thurmon JC, Grimm KA, eds. *Lumb and Jones' veterinary anesthesia and analgesia*. 4th ed. Ames: Blackwell; 2007:705–17.
6. Looney AL, Bohling MW, Bushby PA. The Association of Shelter Veterinarians veterinary medical care guidelines for spay-neuter programs Association of Shelter Veterinarians<sup>1</sup> Spay-Neuter Task Force. *J Am Vet Med Assoc* 2008;233:1,74–86.
7. Hellyer P, Rodan I, Brunt J, et al; American Animal Hospital Association; American Association of Feline Practitioners; AAHA/AAFP Pain Management Guidelines Task Force Members. AAHA/AAFP pain management guidelines for dogs & cats. *J Am Anim Hosp Assoc* 2007;43(5):235–48.
8. Gaynor J, Muir W. *Handbook of veterinary pain management*. 2nd ed. St. Louis: Mosby, Inc.; 2009.
9. Greene S. *Veterinary anesthesia and pain management secrets*. Philadelphia: Hanley & Belfus; 2001.
10. Brezis M, Rosen S. Hypoxia of the renal medulla—its implications for disease. *N Engl J Med* 1995;332(10):647–55.
11. Heyman SN, Fuchs S, Brezis M. The role of medullary ischemia in acute renal failure. *N Horizons* 1995;3:597–607.
12. Behnia R, Koushanpour E, Brunner EA. Effects of hyperosmotic mannitol infusion on hemodynamics of dog kidney. *Anesth Analg* 1996;82(5):902–8.
13. Fisher AR, Jones P, Barlow P, et al. The influence of mannitol on renal function during and after open-heart surgery. *Perfusion* 1998;13(3):181–6.
14. Evans AT, Wilson DV. Anesthetic emergencies and procedures. In: Tranquilli WJ, Thurmon JC, Grimm KG, eds. *Lumb and Jones'*

- veterinary anesthesia and analgesia*. 4th ed. Ames: Blackwell; 2007: 1033–48.
15. Jakobsen CJ, Torp P, Vester AE, et al. Ketamine reduce left ventricular systolic and diastolic function in patients with ischaemic heart disease. *Acta Anaesthesiol Scand* 2010;54(9): 1137–44.
16. Harvey RC, Ettinger SJ. Cardiovascular disease. In: Tranquilli WJ, Thurman JC, Grimm KA, eds. *Lumb and Jones veterinary anesthesia and analgesia*. 4th ed. Ames, IA: Blackwell Publishing; 2007:891–8.
17. Tobias KM, Marion-Henry K, Wagner R. A retrospective study on the use of acepromazine maleate in dogs with seizures. *J Am Anim Hosp Assoc* 2006;42(4):283–9.
18. McConnell J, Kirby R, Rudloff E. Administration of acepromazine maleate to 31 dogs with a history of seizures. *J Vet Emerg Crit Care* 2007;17(3):262–7.
19. Doxey S, Boswood A. Differences between breeds of dog in a measure of heart rate variability. *Vet Rec* 2004;154(23):713–7.
20. Alvaides RK, Neto FJ, Aguiar AJ, et al. Sedative and cardiorespiratory effects of acepromazine or atropine given before dexmedetomidine in dogs. *Vet Rec* 2008;162(26):852–6.
21. Ko JC, Fox SM, Mandsager RE. Effects of preemptive atropine administration on incidence of medetomidine-induced bradycardia in dogs. *J Am Vet Med Assoc* 2001;218(1):52–8.
22. Hartsfield SM. Anesthetic machines and breathing systems. In: Tranquilli WJ, Thurmon JC, Grimm KA, eds. *Lumb and Jones' veterinary anesthesia and analgesia*. 4th Ed. Ames, IA: Blackwell; 2007:481–2.
23. Lerche P, Muir WW III, Bednarski RM. Rebreathing anesthetic systems in small animal practice. *J Am Vet Med Assoc* 2000;217(4): 485–92.
24. Hodgson DS. The case for non-rebreathing circuits for very small animals. *Vet Clin N Am Sm Anim Pract* 1992;2:397–9.
25. US Dept of Labor, Occupational Safety and Health Administration. Anesthetic Gases: Guidelines for Workplace Exposures. Available at [www.osha.gov/dts/osta/anestheticgases/index.html](http://www.osha.gov/dts/osta/anestheticgases/index.html). Accessed September 23, 2011.
26. ACVA. Control of Waste Anesthetic Gases in the Workplace. Position statements. Available at [www.AVCA.org](http://www.AVCA.org). Accessed September 23, 2011.
27. Bosniak AP, Mann FA, Dodam JR, et al. Comparison of ultrasonic Doppler flow monitor, oscillometric, and direct arterial blood pressure measurements in ill dogs. *J Vet Emerg Crit Care (San Antonio)* 2010;20(2):207–15.
28. Shih A, Robertson S, Vigani A, et al. Evaluation of an indirect oscillometric blood pressure monitor in normotensive and hypotensive anesthetized dogs. *J Vet Emerg Crit Care (San Antonio)* 2010; 20(3):313–8.
29. McNally EM, Robertson SA, Pablo LS. Comparison of time to desaturation between preoxygenated and nonpreoxygenated dogs following sedation with acepromazine maleate and morphine and induction of anesthesia with propofol. *Am J Vet Res* 2009;70(11): 1333–8.
30. Psatha E, Alibhai HI, Jimenez-Lozano A, et al. Clinical efficacy and cardiorespiratory effects of alfaxalone, or diazepam/fentanyl for induction of anaesthesia in dogs that are a poor anaesthetic risk. *Vet Anaesth Analg* 2011;38(1):24–36.
31. Tzannes S, Govendir M, Zaki S, et al. The use of sevoflurane in a 2:1 mixture of nitrous oxide and oxygen for rapid mask induction of anaesthesia in the cat. *J Feline Med Surg* 2002;2:83–90.
32. Dave MH, Koepfer N, Madjdpour C, et al. Tracheal fluid leakage in benchtop trials: comparison of static versus dynamic ventilation model with and without lubrication. *J Anesth* 2010;24(2): 247–52.
33. Hardie EM, Spodnick GJ, Gilson SD, et al. Tracheal rupture in cats: 16 cases (1983–1998). *J Am Vet Med Assoc* 1999;214(4): 508–12.
34. Mitchell SL, McCarthy R, Rudloff E, Pernell RT. Tracheal rupture associated with intubation in cats: 20 cases (1996–1998). *J Am Vet Med Assoc* 2000;216:1592–5.
35. ACVA. Small animal monitoring guidelines. Available at [www.acva.org](http://www.acva.org). Accessed September 23, 2011.
36. Swain SF, Lee AH, Hughes KS. Heating pads and thermal burns in small animals. *J Am An Hosp Assoc* 1989;25:156–62.
37. Brodbelt DC, Pfeiffer DU, Young LE, et al. Results of the confidential enquiry into perioperative small animal fatalities regarding risk factors for anesthetic-related death in dogs. *J Am Vet Med Assoc* 2008;233(7):1096–1104.
38. Brodbelt DC, Blissitt KJ, Hammond RA, et al. The risk of death: the confidential enquiry into perioperative small animal fatalities. *Vet Anaesth Analg* 2008;35(5):365–73.
39. Pottier RG, Dart CM, Perkins NR, et al. Effect of hypothermia on recovery from general anaesthesia in the dog. *Aust Vet J* 2007;85(4): 158–62.

## ***Recommendations for monitoring anesthetized veterinary patients***

### **Position Statement**

The American College of Veterinary Anesthesiologists (ACVA) has revised the set of guidelines for anesthetic monitoring that were originally developed in 1994 and published in 1995<sup>1</sup>. Since then many factors have caused a shift in the benchmark used to measure a successful anesthetic outcome, moving from the lack of anesthetic mortality toward decreased anesthetic morbidity.

This shift toward minimizing anesthetic morbidity has been facilitated by more objective definition and earlier detection of pathophysiologic conditions such as hypotension, hypoxemia and severe hypercapnia. This has resulted from the incorporation of newer monitoring modalities by skilled attentive personnel during anesthesia.

The ACVA recognizes that it is possible to adequately monitor and manage anesthetized patients without specialized equipment and that some of these modalities may be impractical in certain clinical settings. Furthermore, the ACVA does not suggest that using any or all the modalities will ensure any specific patient outcome, or that failure to use them will result in poor outcome.

However, as the standard of veterinary care advances and client expectations expand, revised guidelines are necessary to reflect the importance of vigilant monitoring. The goal of the ACVA guidelines is to improve the level of anesthesia care for veterinary patients. Frequent and continuous monitoring and recording of vital signs in the peri-anesthetic period by trained personnel and the intelligent use of various monitors are requirements for advancing the quality of anesthesia care of veterinary patients.

1. JAVMA 1995;206(7): 936-937.

### **Circulation**

Objective: to ensure adequate circulatory function.

#### Methods:

- 1) Palpation of peripheral pulse to determine rate, rhythm and quality, and evaluation of mucous membrane (MM) color and capillary refill time (CRT).
- 2) Auscultation of heart beat (stethoscope; esophageal stethoscope or other audible heart monitor). Continuous (audible heart or pulse monitor) or intermittent monitoring of the heart rate and rhythm.
- 3) Pulse oximetry to determine the % hemoglobin saturation.
- 4) Electrocardiogram (ECG) continuous display for detection of arrhythmias.
- 5) Blood pressure:
  - a. Non-invasive (indirect): oscillometric method: Doppler ultrasonic flow detector
  - b. Invasive (direct): arterial catheter connected to an aneroid manometer or to a transducer and oscilloscope.

Recommendations:

Continuous awareness of heart rate and rhythm during anesthesia, along with gross assessment of peripheral perfusion (pulse quality, mm color and CRT) are mandatory. Arterial blood pressure and ECG should also be monitored. There may be some situations where these may be temporarily impractical, e.g. movement of an anesthetized patient to a different area of the hospital.

**Oxygenation**

Objective: to ensure adequate oxygenation of the patient's arterial blood.

Methods:

- (1) Pulse oximetry (non-invasive estimation of hemoglobin saturation).
- (2) Arterial blood gas analysis for oxygen partial pressure (PaO<sub>2</sub>).

Recommendations:

Assessment of oxygenation should be done whenever possible by pulse oximetry, with blood gas analysis being employed when necessary for more critically ill patients.

**Ventilation**

Objective: to ensure that the patient's ventilation is adequately maintained.

Methods:

- (1) Observation of thoracic wall movement or observation of breathing bag movement when thoracic wall movement cannot be assessed.
- (2) Auscultation of breath sounds with an external stethoscope, an esophageal stethoscope, or an audible respiratory monitor.
- (3) Capnography (end-expired CO<sub>2</sub> measurement).
- (4) Arterial blood gas analysis for carbon dioxide partial pressure (PaCO<sub>2</sub>).
- (5) Respirometry (tidal volume measurement).

Recommendations:

Qualitative assessment of ventilation is essential as outlined in either 1 or 2 above, and capnography is recommended, with blood gas analysis as necessary.

**Temperature**

Objective: to ensure that patients do not encounter serious deviations from normal body temperature.

Methods:

- (1) Rectal thermometer for intermittent measurement.
- (2) Rectal or esophageal temperature probe for continuous measurement.

Recommendations:

Temperature should be measured periodically during anesthesia and recovery and if possible checked within a few hours after return to the wards.

## **Neuromuscular Blockade**

Objective: to assess the intensity of and recovery from neuromuscular blockade.

Methods:

- (1) Hand-held peripheral nerve stimulator.
- (2) Spirometer.

Recommendations

For any patient in which neuromuscular blockade is used, it is essential to control ventilation, monitor closely for signs of awareness, and be certain of recovery of blockade prior to anesthesia recovery. Recovery of neuromuscular function may be assumed if the evoked response (twitch and/or tetanic fade) to a nerve stimulus, and respiratory tidal volume as measured with a spirometer, return to at least 70% of pre- blockade status. End tidal CO<sub>2</sub> may also be used as an indication of adequate ventilation in spontaneously ventilating patients.

## **Record Keeping**

Objectives:

- (1) To maintain a legal record of significant events related to the anesthetic period.
- (2) To enhance recognition of significant trends or unusual values for physiologic parameters and allow assessment of the response to intervention.

Recommendations:

- (1) Record all drugs administered to each patient in the peri-anesthetic period and in early recovery, noting the dose, time, and route of administration, as well as any adverse reaction to a drug or drug combination.
- (2) Record monitored variables on a regular basis (minimum every 5 to 10 minutes) during anesthesia. The minimum variables that should be recorded are heart rate and respiratory rate, as well as oxygenation status and blood pressure if these were monitored.
- (3) Record heart rate, respiratory rate, and temperature in the early recovery phase.
- (4) Any untoward events or unusual circumstances should be recorded for legal reasons, and for reference should the patient require anesthesia in the future.

## Recovery period

Objective: to ensure a safe and comfortable recovery from anesthesia.

### Methods:

- (1) Observation of respiratory pattern.
- (2) Observation of mucous membrane color and CRT.
- (3) Palpation of pulse rate and quality.
- (4) Measurement of body temperature, with appropriate warming or cooling methods applied if indicated.
- (5) Observation of any behavior that indicates pain, with appropriate pharmaceutical intervention as necessary.
- (6) Other measurements as indicated by patient's medical status, e.g. blood glucose, pulse oximetry, PCV, TP, blood gases, etc.


### Recommendations

Monitoring in recovery should include *at the minimum* evaluation of pulse rate and quality, mucous membrane color, respiratory pattern, signs of pain, and temperature.

## Personnel

Objective: to ensure that a responsible individual is aware of the patient's status at all times during anesthesia and recovery, and is prepared either to intervene when indicated, or to alert the veterinarian in charge about changes in the patient's condition.

### Recommendations:

-  (1) Ideally, a veterinarian, technician, or other responsible person should remain with the patient continuously and be dedicated to that patient only
- (2) If this is not possible, a reliable and knowledgeable person should check the patient's status on a regular basis (at least every 5 minutes) during anesthesia and recovery
- (3) A responsible person may be present in the same room, although not necessarily solely occupied with the anesthetized patient (for instance, the surgeon may also be responsible for overseeing anesthesia)
- (4) In either of (2) or (3) above, audible heart and respiratory monitors must be available.
- (5) A responsible person, solely dedicated to managing and caring for the anesthetized patient during anesthesia, remains with the patient continuously until the end of the anesthetic period.(a, b)

a) Recommended for all patients assessed as ASA status III, IV, or V

b) Recommended for horses anesthetized with inhalation anesthetics and/or horses anesthetized for longer than 45 minutes

## **SEDATION without General Anesthesia**

Sedation is a state characterized by central depression accompanied by drowsiness during which the patient is generally unaware of its surroundings but responsive to noxious manipulation.

(Thurmon JC, Short CE (2007) History and Overview of Veterinary Anesthesia. In: Lumb & Jones' Veterinary Anesthesia and Analgesia. (4th edn). Tranquilli WJ, Thurmon JC, Grimm KA (eds). Blackwell Publishing, Ames Iowa, p. 5)

If a sedated patient is sufficiently obtunded to lose control of protective airway reflexes, it should be monitored as under general anesthesia.

Objective: to ensure adequate oxygenation and hemodynamic stability in the obtunded patient.

### Methods

- (1) Palpation of pulse rate, rhythm, and quality.
- (2) Observation of mucous membrane color and CRT.
- (3) Observation of respiratory rate and pattern.
- (4) Auscultation.
- (5) Pulse oximetry.
- (6) Oxygen supplementation.

### Recommendation

Intermittent monitoring of basic respiratory and cardiovascular parameters in the heavily sedated animal should be routine. Supplemental oxygen, an endotracheal tube, and materials for IV catheterization should always be readily available. Particular attention should be paid to brachycephalic breeds that are particularly at risk for airway obstruction under heavy sedation.

received  
2/14/2012

February 14, 2020

Arizona State Veterinary Medical Examining Board  
1740 West Adams Street, Suite 4600  
Phoenix, Arizona 85007

In re: Karin Burns, DVM (20-67)  
Naunee narrative account

To Whom It May Concern:

On June 5th 2018, Naunee Nichols presented for a routine dental treatment procedure under anesthesia. The anesthesia, professional dental cleaning and dental, including extractions, proceeded as expected and without complication, all as noted in the accompanying anesthesia, surgery and dental reports. Mild bradycardia was managed with atropine and corrected. Also, intermittent hypercapnia was corrected with hyperventilation as needed. Recovery was smooth with vitals (TPR) being normal. Because of adequate pain control and balance anesthesia with injectable medications, we were able to run the isoflurane at 1 and therefore our patient was swallowing and ready to be extubated within 5 minutes of turning off the isoflurane. Naunee was extubated at 11:55 a.m.

Our recovery ward is in an open treatment area and has a glass window to facilitate frequent assessment of post -surgery patients. Provided their vitals are normal, post-op patients are monitored during recovery visually while placed in a kennel, as was the situation in this case. In fact, while Naunee was being monitored, at 3:10 p.m., one of our lead assistants, Jordyn, noted that Naunee seemed tachypneic. As a result, and pursuant to her training, Jordyn immediately went into the kennel for further assessment and noted that she was slightly cyanotic. Jordyn then immediately brought Naunee out of the kennel and contacted the doctors for further assessment. At the time, Naunee still had her catheter in and so 1ml propofol 10mg/ml was given and she was intubated to provide oxygen. At this time, Dr. Griswold assumed responsibility over stabilization of Naunee. At 5:55 pm, Naunee was transported by the owners to the AVECCC for afterhours care and assessment.

It is my understanding that Naunee was treated at the AVECCC for possible right aspiration pneumonia, which is an inherent risk in any anesthetic procedure especially for brachycephalic (short-nosed) breeds. I also understand that Naunee then made a complete recovery, without any complications.

In retrospect, I stand behind the veterinary care we provided in this case, which was in complete compliance with the standard of care. It should be noted that this Board Complaint was filed shortly after the Complainants' civil malpractice lawsuit was dismissed following a January 17, 2020 trial. During that trial, the Complainants standard of care expert, Dr. Eugene Borman, who also happens to be the Complainants' stepfather, admitted that he has never practiced

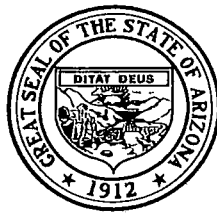
veterinary medicine in Arizona, has never read the Arizona Veterinary Practice Act and did not know what the standard of care was for veterinarians in this state.

Finally, in response to Dr. Borman's statement that is attached to the Complaint in this matter, it should be noted that he has misidentified the treatment date. The subject dental procedure was performed on June 5, 2018, and not June 5, 2019 as stated by Dr. Borman. In any event, nowhere in his statement does Dr. Borman express an opinion that any statutes or regulations were violated or that the veterinary care we provided fell below the standard of care. Instead, he simply says that "I think a review is warranted". In that regard, this case has been thoroughly reviewed by a board-certified veterinarian surgeon Jeffrey Steurer, DVM, MS, DACVS. Unlike Dr. Borman, Dr. Steurer is licensed to practice veterinary medicine in Arizona.

As you can see from his enclosed Expert Opinion Affidavit, Dr. Steurer conducted his medical review and concluded that none of the veterinary care provided by me or the staff at Priority Pet Hospital fell below the standard of care. I am confident that you will reach the same conclusion as Dr. Steurer. Thank you.

A handwritten signature in black ink, appearing to read 'K. Burns', with a long horizontal flourish extending to the right.

Karin Burns, DVM



**ARIZONA STATE VETERINARY MEDICAL EXAMINING BOARD**

1740 W. ADAMS STREET, STE. 4600, PHOENIX, ARIZONA 85007

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VETBOARD.AZ.GOV

**INVESTIGATIVE COMMITTEE REPORT**

**TO:** Arizona State Veterinary Medical Examining Board

**FROM:** PM Investigative Committee: Adam Almaraz - Chair  
Amrit Rai, DVM  
Cameron Dow, DVM  
William Hamilton  
Brian Sidaway, DVM

**STAFF MEMBERS PRESENT:** Tracy A. Riendeau, CVT  
Marc Harris, Assistant Attorney General

**RE:** Case: 20-67

Complainant(s): Warde and Paula Nichols

Respondent(s): Karin M. Burns, DVM (License: 3667)

**SUMMARY:**

Complaint Received at Board Office: 2/3/20

Committee Discussion: 6/2/20

Board IIR: 7/15/20

**APPLICABLE STATUTES AND RULES:**

Laws as Amended April 2018

(Green); Rules as Revised

September 2013 (Yellow)

On June 5, 2018, "Naunee," a 7-year-old female Pug was presented to Respondent for a dental procedure. After the procedure was performed, the dog was taken off anesthesia and placed in recovery. Approximately 3 hours later, the dog was tachypneic with slight cyanosis therefore propofol was administered and intubated to deliver oxygen therapy.

Eventually the dog was transferred to an emergency facility for enhanced care and was discharged 3 days later.

**Complainants were noticed and did not appear.**

**Respondent was noticed and appeared telephonically. Counsel, David Stoll, appeared.**

**The Committee reviewed medical records, testimony, and other documentation as described below:**

- Complainant(s) narrative: Warde and Paula Nichols
- Respondent(s) narrative/medical record: Karin M. Burns, DVM
- Consulting Veterinarian(s) narrative/medical records: Katherine Smith, DVM - AVECCC

**PROPOSED 'FINDINGS of FACT':**

1. On June 5, 2018, the dog was presented to Respondent for a dental procedure. Upon exam, the dog had a weight = 21 pounds, a temperature = 100.7 degrees, a pulse rate = 110bpm and a respiration rate = 40rpm; severe dental tartar and gingivitis was present – grade 3-4 periodontal disease. Respondent noted increase upper airway noise making it difficult to auscult lungs clearly, but no obvious abnormal lung sounds and the dog had normal breathing rate and depth.
2. An IV catheter was placed and Lactated Ringer's Solution was started. Blood work was performed 4/23/18 which was within normal limits. The dog was pre-anesthetized with hydromorphone and acepromazine (route of administration not documented); induced with midazolam and ketamine IV; and maintained on isoflurane and oxygen. Full mouth radiographs were performed; 12 teeth were extracted and tooth 108 had an uncomplicated slab fracture. During the dental procedure the dog was administered buprenorphine IV. At approximately 11:20am, the dog became bradycardic and was administered atropine (? drug not documented) IV and was corrected. Additionally, during the procedure it was reported that the dog became hypercapnic and was hyperventilated to correct. When the procedure was completed, at approximately 11:55am, the dog began to swallow after 5 minutes therefore the endotracheal tube was removed. Respondent commented that due to the dog being on a low level of isoflurane, she recovered quickly needing to be extubated.
3. Respondent described that the recovery ward was in an open treatment area and had a glass window to facilitate frequent assessment of post-surgical patients. When vitals were normal, post-op patients were monitored during their recovery visually while placed in a kennel, which was the case in this situation.
4. At approximately 3:10pm, technical staff member, Jordan, noted that the dog appeared tachypneic, she went into the kennel to assess the dog, and noted that the dog was slightly cyanotic. Jordan immediately brought the dog to the treatment area and alerted the doctors for further assessment. Respondent stated in her narrative that 1mL of propofol was administered to the dog and intubated to provide oxygen. At this point, Respondent's associate, Dr. Griswold assumed responsibility over stabilization of the dog.
5. At approximately 3:20pm, Dr. Griswold stated that he took over the care of the dog shortly after intubation. Oxygen saturation and respiration rate was continuously monitored; when the dog would begin to chew on the endotracheal tube, more propofol would be administered. Radiographs were taken and revealed increased soft tissue pulmonary opacity and air bronchograms in the right hemithorax as well as gas distention of the gastric lumen. A red rubber catheter was passed esophageally to release air from the gastric lumen. Respondent administered 1mg of dexamethasone sodium phosphate IV and later butorphanol injections were administered IV which resulted in the increase in the dog's oxygen saturation levels.
6. The dog was able to be extubated, exhibiting breath sounds that were observed prior to the dental procedure. The dog remained tachypneic, but no dyspnea, and mucous membranes were pink, allowing the dog to be transferred to an emergency facility to continued and enhanced care.

7. Upon presentation to Arizona Veterinary Emergency & Critical Care Center Dr. Smith evaluated the dog. The dog had normal vitals except for an elevated respiratory rate and effort. Lung sounds were diminished on the right and crackles were ausculted on the left. Initial venous blood gas showed mild respiratory acidosis with respiratory compensation, mild hyperlactatemia, and mild but clinically insignificant electrolyte changes. Repeat thoracic radiographs confirmed persistent alveolar pattern in the right middle lung lobe most consistent with aspiration pneumonia. The dog was treated; the dog's hyperlactatemia resolved and the dog improved throughout the hospitalization and did not require reintubation.

8. On June 8, 2018, the dog was discharged with an at home oxygen kennel as the dog was eating but was still oxygen dependent and Complainants were unable to continue with hospitalization. The dog eventually made a full recovery.

9. According to Complainants, although the dog recovered, her breathing seems to be louder than it was before the dental procedure and hospitalization for respiratory issues.

#### **COMMITTEE DISCUSSION:**

The Committee discussed that there was documented evidence in the medical record to support the dog was cared for appropriately.

#### **COMMITTEE'S PROPOSED CONCLUSIONS of LAW:**

The Committee concluded that no violations of the *Veterinary Practice Act* occurred.

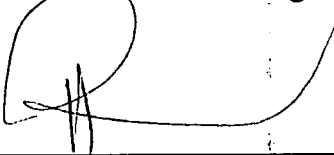
#### **COMMITTEE'S RECOMMENDED DISPOSITION:**

**Motion:** It was moved and seconded the Board:

*Dismiss this issue with no violation.*

**Vote:** The motion was approved with a vote of 5 to 0.

*The information contained in this report was obtained from the case file, which includes the complaint, the respondent's response, any consulting veterinarian or witness input, and any other sources used to gather information for the investigation.*




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Tracy A. Riendeau, CVT  
Investigative Division